

**VERSION WITH MARKINGS TO SHOW CHANGES MADE:**

**IN THE SPECIFICATION:**

Paragraph [0020] has been amended as follows:

[0020] Referring now to FIG. 1, an electric synchronous machine (the machine itself is not shown) according to the invention has a stator 1 which can be constructed essentially in the same manner as the conventional stator 71 described above with reference to FIG. 7. The exemplary stator 1 is designed with 6 pole pairs and a standard winding pattern with 18 grooves 3. The stator 1 has individual grooves 3 which are separated from each other by teeth 4. Teeth enlargements 5 are employed to increase the width of the teeth 4 towards the air gap of the electric synchronous machine. The windings (not shown) are arranged in the grooves 3. The rotor 2 has permanent magnets 6 which are arranged in a direction so as to concentrate the magnetic flux. The term "flux concentration arrangement" refers to an arrangement of the permanent magnets 6 by which the magnetic field lines attain their maximum density inside the air gap 7 of the electric synchronous machine. Also indicated in FIG. 1 are the average coil width  $\tau_{sp}$  of the stator and the pole pitch width  $\tau_p$  of the rotor. Coil width  $\tau_{sp}$  herein represents the width of a coil, expressed for a rotary motor in angular units, e.g. degrees, such as the width (60°) of a coil connecting terminals  $u_1$  and  $u_2$  in FIG. 7. Pole pitch width  $\tau_p$  represents the separation, in this case also in angular units, between regularly arranged poles. In the

conventional arrangement of FIG. 7, the coil width  $\tau_{sp}$  is equal to the pole pitch width  $\tau_p$ .

Paragraph [0021] has been amended as follows:

[0021] -- The windings can be wound around more than one tooth 4 of the coils. In fact, all winding types and systems known in the art, such as fractional pitch windings, two-layer windings, etc., can be employed. An exemplary winding pattern can be a conventional winding pattern for a three-phase stator coil depicted in Fig. 7. --

**IN THE DRAWING:**

FIGS. 1, 2 and 7 have been amended as per copy enclosed and indicated in red.

## REMARKS

The last Office Action of October 25, 2002 has been carefully considered. Reconsideration of the instant application in view of the foregoing amendments and the following remarks is respectfully requested.

Claims 1-15 are pending in the application. No claims have been amended, canceled or added. Enclosed is also a marked-up version of the changes made to the specification by the current amendment. The enclosed page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

It is noted that the drawings are objected to because of applicant's failure to show every feature set forth in the claims and to label Fig. 7 as prior art. Drawing proposals showing the required changes are submitted herewith together with a communication to the draftsman.

It is further noted that the specification is objected to as failing to provide proper antecedent basis for claimed subject matter. Claims 1-15 are rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1-15 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-9 and 12-15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Pat. No. 5,642,013 (hereinafter "Wavre").

Claims 10-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Wavre in view of U.S. Pat. No. 4,242,610 (hereinafter "McCarthy et al.").

### **OBJECTION TO THE DRAWING**

Applicant has made amendments to the Figs. 1 and 2 in order to address the objection by the Examiner. More specifically, applicant has inserted the winding designations  $u_1, u_2, \dots, w_2, w_3$  from Fig. 7. The examiner is asked to approve the changes to Figs. 1 and 2 for the following reasons:

As stated in paragraph [0020]: "The windings (not shown) are arranged in the grooves 3." It is further stated in paragraph [0021] that "all winding types and systems known in the art, such as fractional pitch windings, two-layer windings, etc., can be employed." Applicants therefore submit that persons with ordinary skill in the art will understand that the grooves 3 contains windings, without the need to show individual winding strands. Those persons will also understand that the letters  $u_1, u_2, \dots, w_2, w_3$  in Fig. 7 designate the winding connections for the 3 phases u, v, w. Accordingly, no new matter is being introduced by amending Figs. 1 and 2.

Fig. 7 has been labeled "prior art" as suggested by the Examiner.

Withdrawal of the objection to the drawing is thus respectfully requested.

## **REJECTION UNDER 35 U.S.C. §112, FIRST AND SECOND PARAGRAPHS**

The rejection of claims 1-5 under 35 U.S.C. §112, first and second paragraph, has been addressed by amendments to paragraphs [0020] and [0021] of the specification. The term “pole pitch (width)  $\tau_p$ ” is identical to that used throughout US patent 5,642,013 to Wavre, cited by the examiner. The term “coil width  $\tau_{sp}$ ” has now been defined in amended paragraph [0020], which is supported by Fig. 1.

Applicant respectfully submits that the changes to the specification and the drawings do not add new matter.

Withdrawal of the rejection of claims 1-15 under 35 U.S.C. §112, first and second paragraphs is thus respectfully requested.

## **REJECTION UNDER 35 U.S.C. §103(a)**

The rejection of claims 1-9 and 12-15 under 35 U.S.C. §103(a) as being unpatentable over Wavre is hereby traversed and reconsideration thereof is respectfully requested in view of remarks set forth below.

Independent claim 1 is directed to an electric synchronous machine with a stator having a winding with an average coil width  $\tau_{sp}$ ; a rotor having a pole pair number  $2p$  with a pole pitch width  $\tau_p$ ; and permanent magnets attached to the rotor. A pitch ratio  $\tau_{sp}/\tau_p$  is greater than or equal to 2.5. Claims 2 - 15 depend from claim 1.

Wavre discloses a synchronous motor with an armature comprising a yoke, a plurality of teeth having each a first end solid with the yoke and defining therebetween slots, and coils partly disposed in the slots and each surrounding one of the teeth.

Wavre teaches that the reluctant effect by one slot (e.g. if the armature only had a single slot) is actually very large, the reluctant effect produced by several consecutive slots is reduced to a value that is much lower than that found with the prior art motor. (Col. 2, line 36-40). The graph of FIG. 7 [ ... ] is for a motor having the same pole pitch  $\tau_p$  to tooth pitch  $\tau_n$  ratio, i.e. for example 16 mm and 12 mm respectively. (Col. 5, line 12-15). Wavre further states that the reduction of the reluctant effect will be all the better when the number of slots is large. (Col. 5, line 15-36). The coils 30, 31 of Wavre surround a single tooth 25. (Figs. 8 and 9; see col. 6, line 49-59).

As discussed above and seen from Wavre's Figs. 8 and 9, the pole pitch  $\tau_p$  to tooth pitch  $\tau_n$  ratio proposed by Wavre is always approximately equal to one. In addition, Wavre proposes to increase the number of slots, which would further decrease the ratio  $\tau_p/\tau_n$  below one.

Wavre, however, does not disclose, teach or suggest a motor with a pitch ratio  $\tau_{sp}/\tau_p$  of greater than or equal to 2.5, as recited in claim 1. In effect, Wavre teaches away from increasing the pitch ratio  $\tau_{sp}/\tau_p$  above approximately one, as discussed above. The electric machines proposed in the present application have a high pole number and a small number of coils, as reflected in the high pitch

ratio  $\tau_{sp}/\tau_p$  of  $\geq 2.5$ , which is not suggested by the prior art of record. The advantages of such machines are explained in paragraphs [0006] and [0007] of the present application.

Accordingly, Applicant submits that the subject matter recited in claim 1 represents an inventive and novel approach for improving the performance of electric machines not previously suggested and respectfully request that the rejection of claim 1 be withdrawn.

Also McCarthy et al. and Nakagawa fail to disclose the range for the pitch ratio  $\tau_{sp}/\tau_p$  recited in claim 1.

As for the rejection of the dependent claims 2-15, these claims depend on claim 1, share its presumably allowable features, and therefore it is respectfully submitted that these claims should also be allowed.

Withdrawal of the rejection of claims 1-15. under 35 U.S.C. §103(a) and allowance thereof are thus respectfully requested.

## **CITED REFERENCES**

Applicant has also carefully scrutinized the further cited prior art and finds it without any relevance to the newly submitted claims. It is thus felt that no specific discussion thereof is necessary.

## CONCLUSION

Applicant believes that when the Examiner reconsiders the claims in the light of the above comments, he will agree that the invention is in no way properly met or anticipated or even suggested by any of the references however they are considered.

In view of the above presented remarks and amendments, it is respectfully submitted that all claims on file should be considered patentably differentiated over the art and should be allowed.

Reconsideration and allowance of the present application are respectfully requested.

Should the Examiner consider necessary or desirable any formal changes anywhere in the specification, claims and/or drawing, then it is respectfully requested that such changes be made by Examiner's Amendment, if the Examiner feels this would facilitate passage of the case to issuance. If the Examiner feels that it might be helpful in advancing this case by calling the undersigned, applicant would greatly appreciate such a telephone interview.

Respectfully submitted,

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